SECTION 13110 CATHODIC PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

- A. These specifications define materials and installation practices to minimize corrosion and to provide facilities for long-term corrosion monitoring of the proposed pipeline.
- B. Installation of corrosion control components shall be in accordance with the following specifications, and accompanying design drawings. All installation practices and components shall be approved by representatives of the Authority.
- C. The corrosion control system shall include electrical continuity (joint bonding), sacrificial anode (magnesium) ground-beds, polyethylene encasement and corrosion control test
- 1.02 SUBMITTALS
- A. Product Data: Submit manufacturer catalog cuts or other descriptive information for the specific materials required on this project for approval.
- Packaged Magnesium Anodes
- Test Stations and Terminal Boards Current Measuring Shunt
- Wire And Cable Thermite Welding Equipment
- Thermite Weld Coating Materials External Coating for Mechanical Joints and Couplings
- Mastic Coating
- Wire Connections and Terminations Electrical Tape
- Electrical Coating Compound
- Field Test Equipment Warning Tape

Separator Mesh

- Test Station Concrete Polvethylene Encasement
- B. Quality Assurance: Submit in conjunction with product data:
- 1. Installation and Test Personnel Qualifications for Pipe Joint Bonding and Corrosion
- 2. Qualifications of NACE International Certified Corrosion Specialist
- Proposed Test Data Forms
- C. Close-Out: Submit no later than 10 working days before application for beneficial use:

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- 2. Continental Industries, Inc., Tulsa, OK: Thermoweld.
- B. Materials: Mold, weld metal, other material and equipment per manufacturer's recommendations for particular pipe/cable material and size. Only material and equipment from same manufacturer is allowed. Adapter sleeves shall be utilized for all thermite welds.
- 2.06 THERMITE WELD COATING MATERIALS
- A. Thermite weld coating material:
- 1. Thermite welds shall be coated with a prefabricated assembly specially designed for covering cathodic protection wire connections to piping and fittings. The prefabricated assembly shall consist of the following components: 1) top plastic sheet formed with an igloo shaped dome and entry tunnel for the lead wire; 2) a special elastomeric compound in the plastic dome firm enough to resist flow at normally encountered application and operating temperatures, but soft enough to mold itself around and completely cover the irregular welded profile; 3) a double row of parallel, flexible serrations on either side of the dome to assist with conforming around small diameter pipe; 4) a base of black unbacked elastomeric tape with exceptional adhesive properties for bonding firmly to a surface when used with the appropriate primer. Caps shall be as manufactured by Royston Laboratories Division, Model Handy-Cap or approved equal. The appropriate primer as required by the elastomeric cap manufacturer shall be used. For Royston Handy-Caps, the primer shall be Royston Model Roybond 747 Primer.
- 2.07 EXTERNAL COATING FOR MECHANICAL JOINTS AND COUPLINGS
- A. General Requirements:
- 1. All coatings used on project shall be from same manufacturer and as specified herein, unless otherwise approved by the Engineer prior to bidding. All products comprising completed coating system shall be compatible and the same products shall be used throughout the project. Pipe surfaces that will come in contact with potable water inside the pipeline (e.g. spigot ends of bell and spigot joints) shall be coated with materials having NSF-61 certification.
- B. Field Applied Petrolatum Tape Mechanical Joints and Couplings:
- 1. Approved Manufacturers:
- a. Denso North America, Inc., Houston, TX: Petrolatum System.
- b. Trenton Corporation, Ann Arbor, MI: Wax Tape.
- 2. Materials: Compatible primer; mastic for profiling around joints, bolts and other irregular shapes; petrolatum impregnated fabric tape; outer protective wrap. All materials shall be by the same manufacturer.
- C. Field Applied Heat Shrink Sleeves Mechanical Joints and Couplings:
- Approved Manufacturers:

REVISION

NO. DATE BY

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- 1. Letter of Compliance
- Record Drawings
- Test Report
- 1.03 QUALITY ASSURANCE
- A. Qualifications: Installation, quality assurance, and testing personnel must have demonstrated experience with similar work.
- 1. Must be specifically named in qualification submittal and have completed at least three successful corrosion control systems within last three years for underground pipelines of similar type, similar size and equal complexity.
- 2. Must be full-time contractor or subcontractor employees. Part-time or contract personnel hired only for this work will not be permitted.
- 3. Only personnel approved by the Engineer are permitted. Personnel changes during course of project must be minimized and submitted to the Engineer at least two weeks prior to planned implementation.
- B. Supervision: Employ a Corrosion Specialist certified by NACE International to perform the
- 1. Oversee and certify installation and related testing. Including pipe joint bonding, magnesium anodes groundbeds, and corrosion control equipment. Individual must participate in field activities to extent required by work.
- 2. Issue letter of compliance indicating all corrosion control measures are satisfactorily installed and comply with contract documents. The letter of compliance shall be signed by the NACE International Corrosion Specialist.
- 1.04 RECORD DRAWINGS:
- A. General: Document installed location and configuration of each test station using Loudoun County as-built sketch plate, including:
 - 1. Test station number per schedule and installed pipeline station number.
 - 2. Three-dimensional ties between test station and existing permanent datum.
 - 3. Distance from test station to guard post, where installed
 - 4. Wire routing, size, insulation color and termination configuration on terminal board.
 - Pipeline station numbers for wire attachments to pipe.
 - 6. Anode locations, where installed, including pipeline station number, depth and distance

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- a. Canusa, The Woodlands, TX
- b. Raychem Corporation
- 2. Materials: Contractor shall provide compatible primer, mastic for profiling around joints, bolts and other irregular shapes. All materials shall be by the same manufacturer.
- 2.08 MASTIC COATING
- A. The field applied external coating (Roskote R28 Rubberized Mastic or approved equal) shall be a cold applied mastic with high electrical resistivity (2.12 X 10" ohms-cm) and 58.6% solids by volume. The external coating shall be applied only where noted in:
- 1. Buried mechanical joints, buried bolts, nuts, coupling harness tie rods, saddles, iron and steel anchors, and other connecting hardware.
- 2. Service clamps, other transition fittings between copper services and ductile iron or
- 2.09 WIRE CONNECTORS & TERMINATIONS
- A. Terminal Lugs
- 1. Approved Manufacturers: Thomas and Betts Corporation, Raritan, NJ: Series 54100
- 2. Materials: One-hole, compression terminal lugs for 0.25 inch bolt size. B. Butt Splices:
- 1. Approved Manufacturers: Thomas and Betts Corporation, Raritan, NJ: Series 5450
- Materials: Non-insulated type
- 2.10 ELECTRICAL TAPE
- A. Vinyl Plastic
- Approved Manufacturers: 3M Company, St. Paul, MN: Scotch 88.
- B. Rubber Splicing
- 1. Approved Manufacturers: 3M Company, St. Paul, MN: Scotch 130C.
- 2.11 ELECTRICAL COATING COMPOUND.
- A. Approved Manufacturers: 3M Company, St. Paul, MN: Scotchkote.
- 2.12 FIELD TEST EQUIPMENT

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from pipe.

7. Pipeline station number and arrangement of interconnecting fittings.

PART 2 PRODUCTS

2.01 PACKAGED MAGNESIUM ANODES

- A. Approved Manufacturers
- 1. Brance Krachy
- 2. Stuart Steel Protection Company
- Piping and Corrosion Specialties B. Materials: Packaged high potential type comprised of magnesium ingot, wire, and prepared backfill. (Standard 32 lb anode unless otherwise specified)
- 1. Ingot Weight: 32 pounds.

by 2.375 inches).

- 2. Ingot Nominal Dimensions: 58.75 inches long and D-shaped (2.5 inches by 2.5 inches
- 3. Composition of the anode shall be as follows:

ELEMENT 0.010% Maximum Aluminum 0.20% to 0.50% Manganese Copper 0.002% Maximum 0.001% Maximum Zinc 3.5% Maximum 0.003% Maximum Silicon 0.01% Maximum Other 0.01 Maximum Magnesium

- 4. Packaging and Backfill: The anode shall be vibratory packaged in a permeable cardboard box (minimum 24 inches long by 7.5 inches on each side) containing a minimum of 40 pounds of prepared backfill
- Backfill composition by weight.

Hydrated Gypsum Benton te 20% Sodium Sulfate

6. Wire: AWG No. 12 solid copper wire with TW insulation (black) shall be attached to the anode. Wire to anode attachment shall be by silver solder and sealed to prevent any moisture penetration. Length to meet specific field conditions with no splices other than to common header cable, where indicated

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- A. As determined by Contractor to meet specific requirements. All electrical instruments must bear evidence of calibration within 1 year of testing.
- 2.13 UTILITY WARNING TAPE
- A. Approved Manufacturers 1. Allen Systems, Houston, TX: Detectatape.
 - 2. Lineguard, Inc., Wheaton, IL: Lineguard Super Tuff III.
- B. Materials: Minimum 3 inches or 6 inches wide detectable warning tape, red or yellow in color, marked "Caution Cathodic Protection Cable Burled Below" at maximum intervals of
- 2.14 TEST STATION CONCRETE
- A. Materials: Ready-mix concrete conforming to ASTM C94. Minimum allowable 28-day compressive field strength shall be 3,000 psi when cured and tested in conformance with ASTM C31 and ASTM C39. Portland cement shall be Type 1.
- 2.15 POLYETHYLENE ENCASEMENT
- A. Approved Manufacturers: Van Leer/REPCOR, AA Thread Seal Tape, Inc.
- B. Reference Standards: ANSI/AWWA C105/A21.5, Class B Materials: Seamless 4 mils thick high density cross-laminated polyethylene. Flat tube form, minimum width based on nominal pipe diameter in accordance with recommendations by Ductile Iron Pipe Research
- 2.16 SEPARATOR MESH
- A. Approved Manufacturers
- 1. Stuart Steel Protection Company
- B. Materials
- 1. The separator mesh shall be a medium density flexible polyethylene webbing pad (mesh pattern), nominal thickness 0.156 inch
- PART 3 EXECUTION
- 3.01 INSTALLATION
- A. Handling of Pipe
 - 1. At the project site, the pipe shall not be handled with metal chains, cables, unpadded tongs, forklifts or other equipment likely to cause damage to the pipe shop coating or score the pipe surface.
 - 2. Storing of the pipe shall be on padded 12-inch wide (minimum) skids or select learny

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7. Open Circuit Potential: Minimum negative potential of 1.6 volts referenced to copper/copper sulfate.

2.02 TEST STATIONS AND TERMINAL BOARDS

- A. Flush Mount Valve Box Type
- Approved Manufacturers: Bingham and Taylor.
- B. Materials:
- 1. The test station shall be a standard LCSA cast iron valve box (upper section only) with
- 2. "LCSA CP TEST" shall be cast into the cast iron lid in 1 inch high letters.
- 3. The lid shall be coated with two coats of shop applied OSHA safety blue polyurethane or epoxy paint.
- 4. The terminal board shall be 4 inch by 6 inch by 0.25 inch thick phenolic board, 7 terminals, one 0.01 ohm (8 ampere) shunt, 2 copper shorting straps (0.50 inch wide by 0.03 inch thick by 1.5 inches long, with 2 holes predrilled for mounting) and 0.25 inch diameter nickel plated brass hardware.
- 2.03 CURRENT MEASURING SHUNT

A. Materials:

1. Test station shunts shall be constructed to fit the terminal posts for the specified test station. The resistance shall be 0.01 ohm with a current capacity of 8 amperes. The shunt shall be as manufactured by Cott Manufacturing Company Model "Yellow" or approved equal.

2.04 WIRE AND CABLE

- 1. All wiring shall be stranded copper wire of the AWG wire size and color shown on the
- 2. Wire for bonded joints shall be single conductor, stranded copper with high molecular weight polyethylene (HMWPE) insulation (black). Wire size shall be AWG No. 4.
- 3. Wire for test stations shall be single conductor, stranded copper wire with 600-volt THWN or HMWPE insulation (colors, size and insulation as shown on details).
- 2.05 THERMITE WELDING EQUIPMENT
- A. Approved Manufacturers:
- 1. Erico Products Inc., Cleveland, OH: Cadweld

or sand dirt berms, where possible. In urban areas, pipe should be suspended on padded skids. Where skid chucks are used in contact with the pipe, they should be padded with several layers of padding material. Padded chucks should be placed such that pipe is nested on the skid rather than the chuck. The coated pipe shall not

- be laid on pavement without benefit of padding at contact points. 3. If cables or chains are used during transportation, they must be properly padded with approved, suitable material as required to protect the pipe surface from damage while in transit. Use of a padded horizontal separator strip between successive rows
- of pipe is necessary to prevent damage to the pipe surface. 4. At all times during construction of the pipeline, the Contractor shall take every precaution to prevent damage to the protective shop coating and scoring of the pipe surface. No metal tools or heavy objects shall be permitted to come into contact
- unnecessarily with the pipe surface. B. Thermite Welding: Attach test wires and bond cables to the piping by thermite welding.
- 1. General: All thermite welds shall be made as shown on the Drawings and in accordance with the manufacturer's recommendations using the proper combination of equipment for the pipe and wire size being welded. All welding materials and equipment shall be the product of a single manufacturer.
- 1. Area Preparation: Assure that the area where the attachment is to be made is absolutely dry. Remove mill coating, dirt, grime and grease from the pipe or fitting surface at the weld location by wire brushing or by the use of suitable safety solvents. Clean an area (two inches square) of the pipe or fitting surface at the weld location to a bright shiny surface, free of all serious pits and flaws by use of a mechanical
- 2. Cable Preparation: Prepare the wire for welding by assuring that the cable is absolutely dry. The cable shall be free of dirt, grease and other foreign products. Cut the cable in such a way as to avoid flattening or forcing out of round. To prevent deformation of the cable, cut the cable with cable cutters. Remove the insulation in a manner that will avoid damage to strands. Install adapter sleeves for all bonds and test wires in accordance with the manufacturer's recommendations prior to welding. Either prefabricated factory sleeved joint bonds or bond wire with formed sleeves made in the field are acceptable. Hold the cable at an approximate 30 degree angle
- to the pipe surface when welding. 3. Installation: Install thermite welds in accordance with the manufacturer's written instructions. Deliver packaged weld charges to job site in new, unopened dry containers. Replace completed welds having burnt wire strands and wire strands not completely covered with weldment.
- 4. Testing: When the weld has cooled, remove the weld slag and test the weldment for strength by striking a sharp blow with a two pound hammer while pulling firmly on the wire in direction parallel to pipe. Replace unsound welds and retest weldments.
- a. Documentation: Record adequacy of each bond cable and test wire weld based on the above procedure and visual inspection before and after coating weld area. Data recorded for each bond cable and test wire to include date of inspection,

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LOUDOUN COUNTY **SANITATION AUTHORITY**

880 HARRISON STREET, SE LEESBURG, VIRGINIA 20175 (703) 771-1095

CORROSION CONTROL DETAILS



SCALE AS SHOWN HORIZ: _ VERT: AS SHOWN

DRAWN BY:

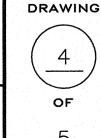
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PROJECT NO

LOUDOUN COUNTY SANITATION AUTHORITY RT. 607 AND RT.7 30" WATER MAIN LOUDOUN COUNTY, V.A. JOB NO.



SHEETS